

**ABSTRACT:****FUNCTIONALISED SURFACE SENSING APPARATUS AND METHODS**

This invention is generally concerned with sensing techniques based upon evanescent-wave cavity ring-down spectroscopy (CRDS), with particular reference to functionalising a sensing surface with the aim of increasing specificity and/or sensitivity.

An evanescent wave cavity-based optical sensor is described. The sensor comprises an optical cavity formed by a pair of highly reflective surfaces such that light within said cavity makes a plurality of passes between said surfaces, an optical path between said surfaces including a reflection from a totally internally reflecting (TIR) surface, said reflection from said TIR surface generating an evanescent wave to provide a sensing function; a light source to inject light into said cavity; and a detector to detect a light level within said cavity; and wherein said TIR surface is provided with a functionalising material over at least part of said TIR surface such that said evanescent wave interacts with said material; whereby an interaction between said functionalising material and a target to be sensed is detectable as a change in absorption of said evanescent wave. Preferably the TIR surface has substantially no features with a dimension perpendicular to the surface of greater than  $3\mu\text{m}$ , more preferably  $1\mu\text{m}$ .

Figure 4a